Testing Requirements

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Testing Requirements

Criteria	Test Procedure	Sample Size	Testing Laboratory
Luminaire Efficacy	LM-79-2008	3	DOE approved 3rd Party
Minimum Light Output	LM-79-2008	3	DOE approved 3rd Party
Correlated Color Temperature (CCT)	LM-79-2008	3	DOE approved 3rd Party
Color Rendering Index (CRI)	LM-79-2008	3	DOE approved 3rd Party
Color Spatial Uniformity	LM-79-2008	3	Self-Certification
Color Maintenance	LM-79-2008	3	Self-Certification
Lumen Maintenance (L_{70})	LM-80-XX*		DOE approved Device Manufacturer
In situ Temperature Measurement Test	UL1598-2004	1	DOE approved 3rd Party or UL Signatory

* In development

Testing Requirements (cont.)

Criteria	Test Procedure	Sample Size	Testing Laboratory
In situ Temperature Measurement Test	UL1598-2004	1	DOE approved 3rd Party or UL Signatory
Power Factor	ANSI C82.77-2002	3	DOE approved 3rd Party
Noise		1	Self Certification
Flicker		1	Self Certification

- "DOE approved" 3rd Party Test Laboratories are currently listed at:

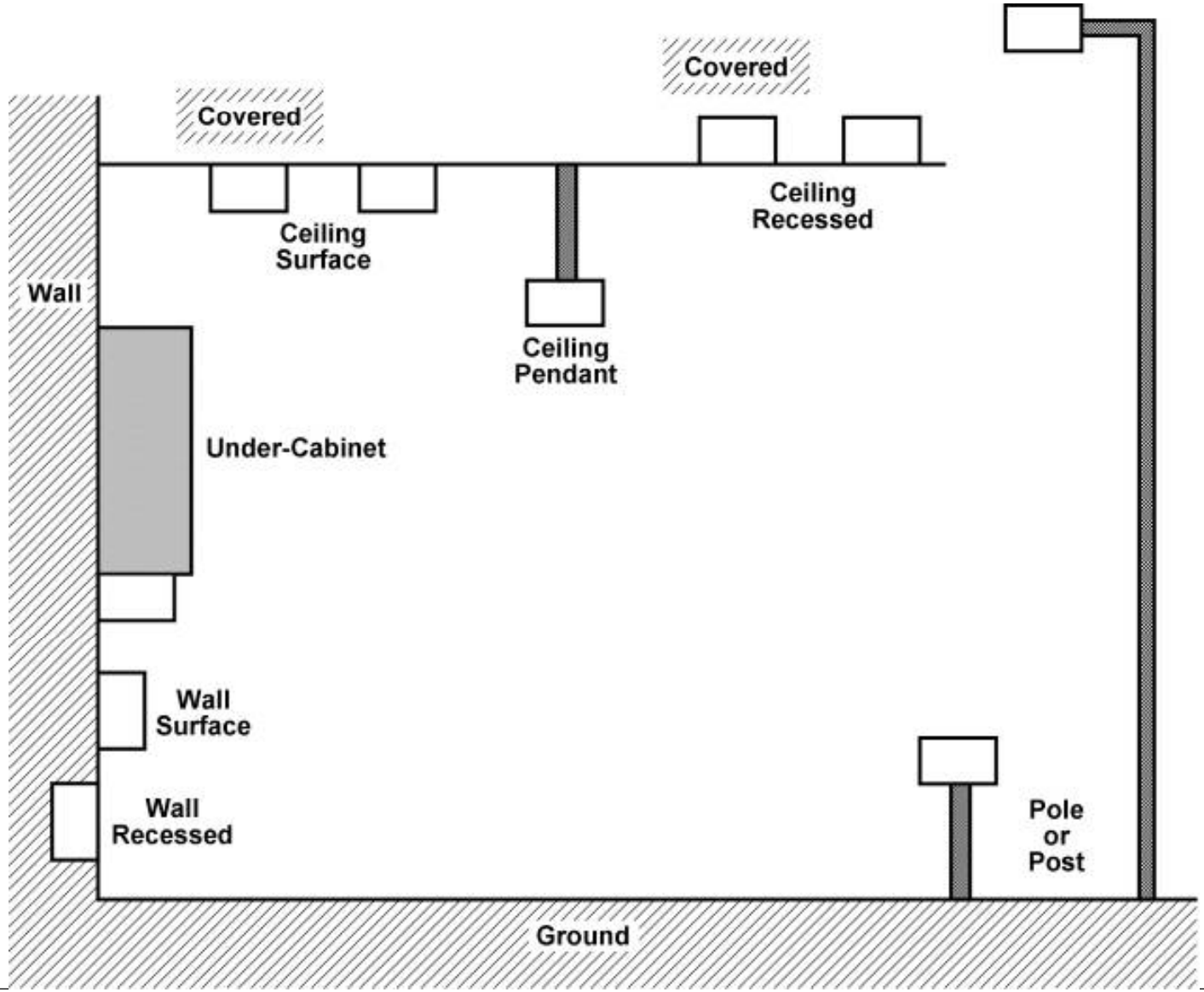
  www.netl.doe.gov/ssl/CALiPER-FAQs.htm

- DOE is actively soliciting additional laboratories

In Situ Testing Requirement

- Lumen depreciation (Life) determined by in situ temperature measurements of:
  - Module, Array or Light Engine
  - Power Supply/Driver
- Testing may be conducted at the same time as UL 1598.
- Testing conducted by independent third-party laboratory
- DOE will publish the In situ Temperature Measurement Test Procedure in June.

UL 1598 Environments



General Procedure

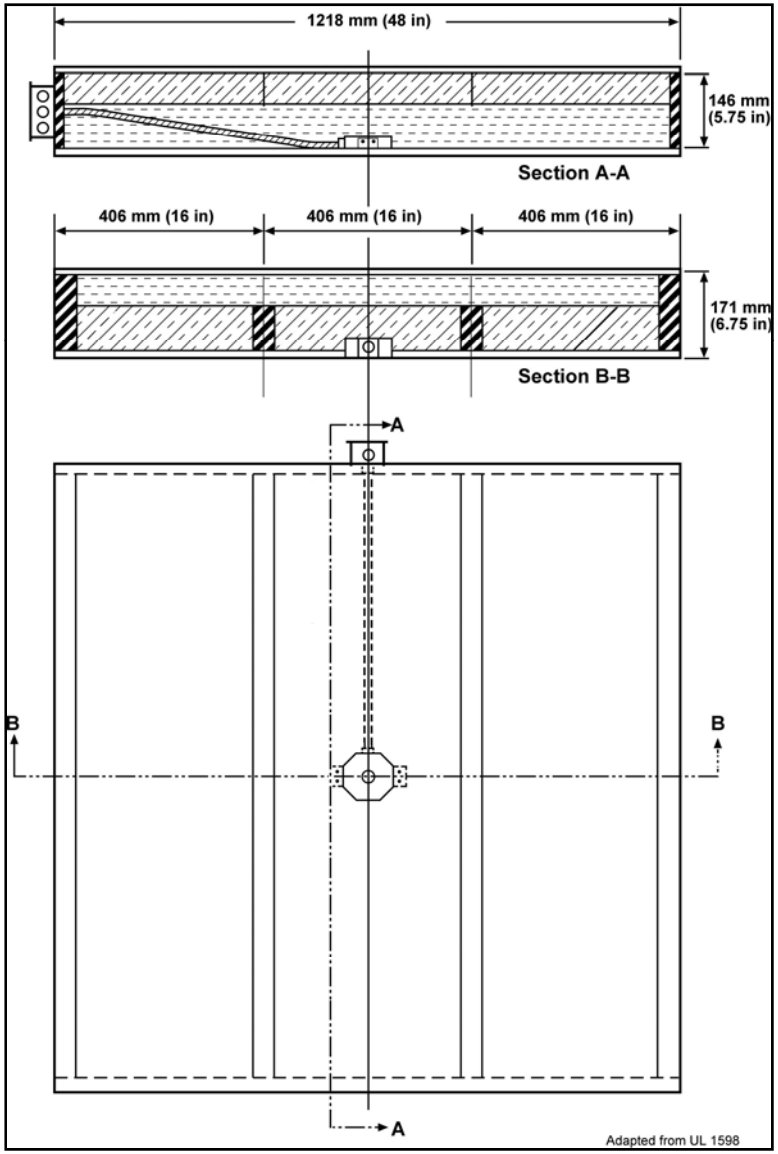
- Affix thermocouple to hottest LED device/array in the luminaire (designated by the luminaire manufacturer)
- Affix thermocouple to T_c or T_b Power Supply/Driver (designated by supplier)
- Install luminaire in UL 1598 Test Apparatus
- Allow system to reach thermal equilibrium
- Take readings and compare to LM-80 test data for device and power supply manufacturer warranty

Thermal Equilibrium

- Operate the luminaire in the appropriate UL 1598 Apparatus for:
  - A minimum of 7.5 hours; or
  - The test has been running for a minimum of 3 hours; and
  - 3 successive readings that at 15 min. intervals are with 1°C and are not rising

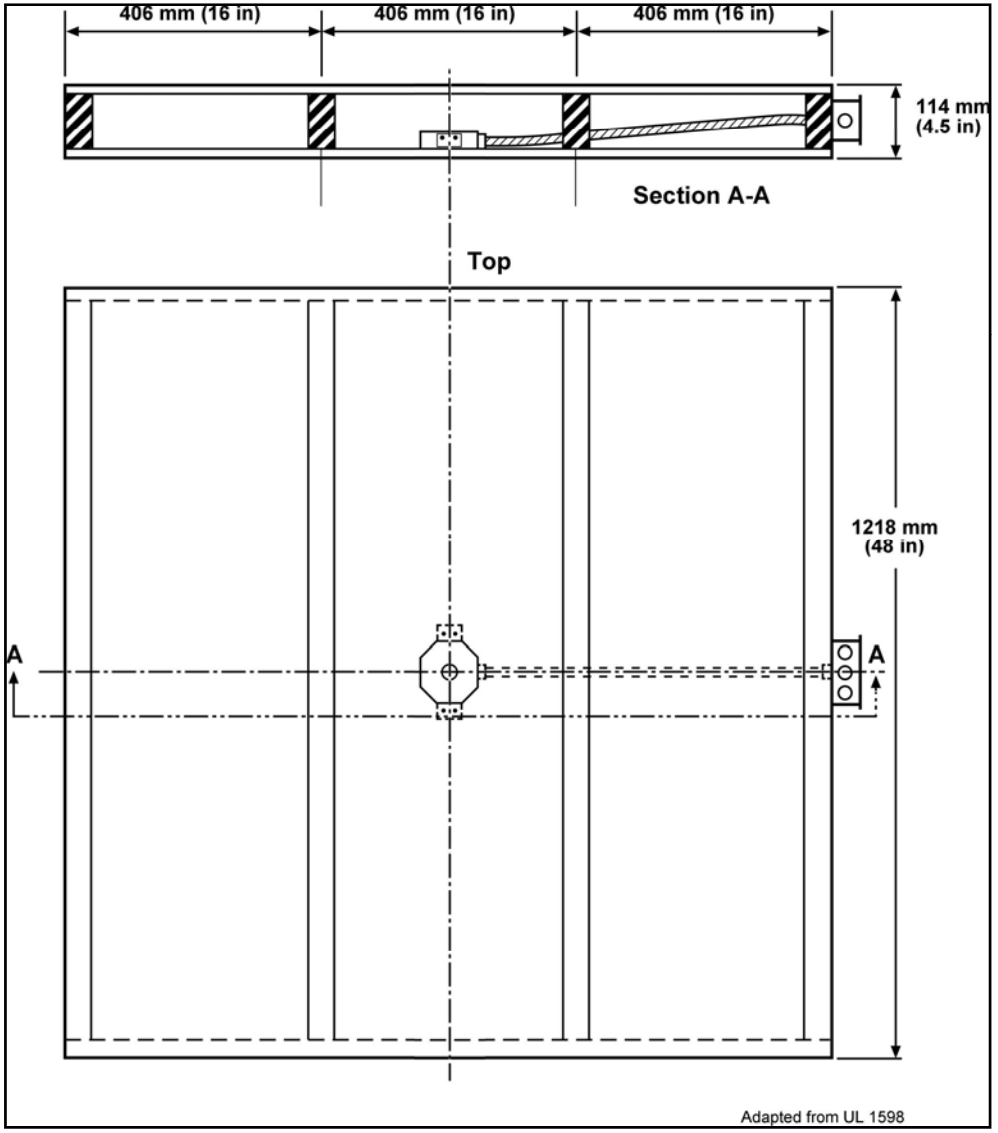
Surface Ceiling Temperature Test Apparatus

- ½" plywood
- 2 x 6 sides
- 1 x 6 ends
- 2 x 4 inside supports
- ≥ 72" above floor
- ≥ 12" below ceiling
- 2 layers of R-8/11 fiberglass insulation



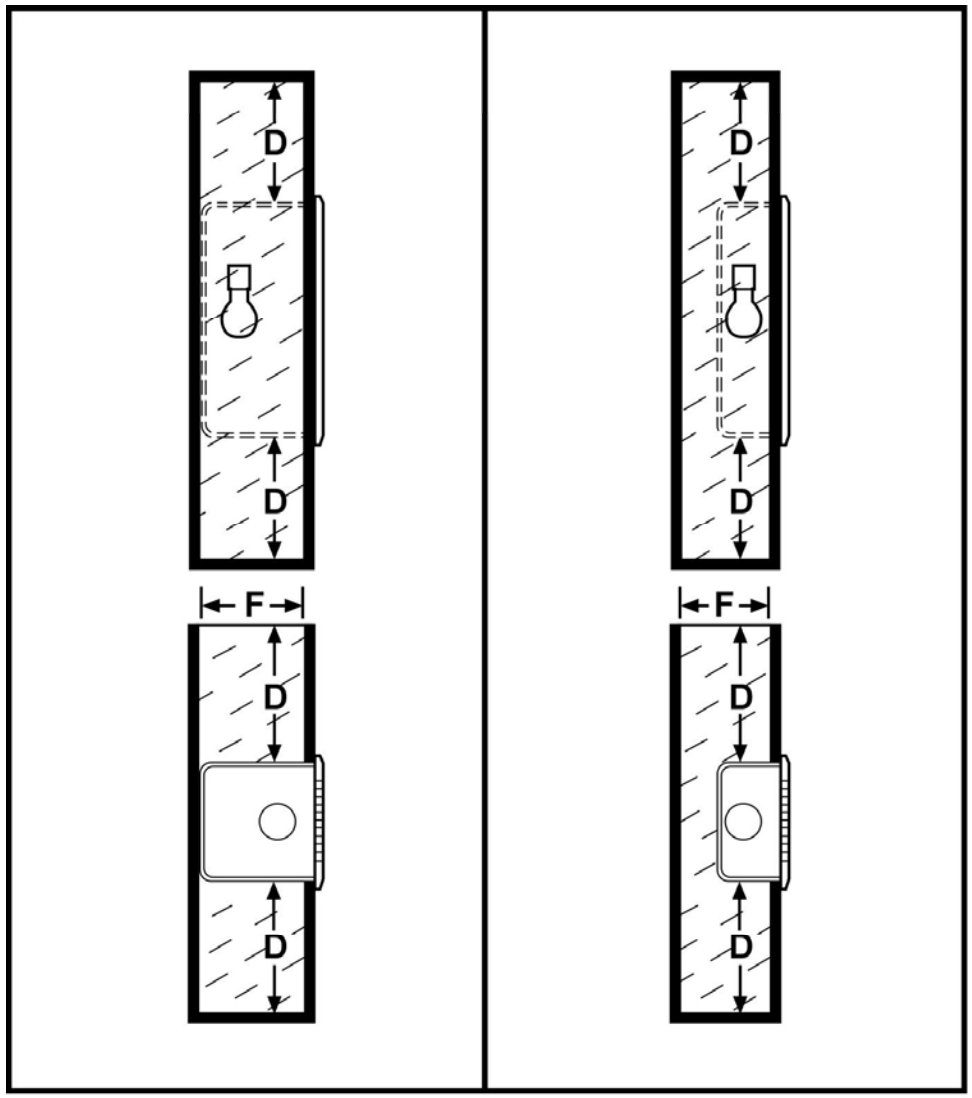
Surface Wall Temperature Test Apparatus

- ½" plywood
- 2 x 4 supports
- 1 x 4 ends
- ≥ 36" above floor
- ≥ 12" below ceiling
- 1 x 4 in horizontal position



Type Non-IC Recessed Wall Temperature Test Apparatus

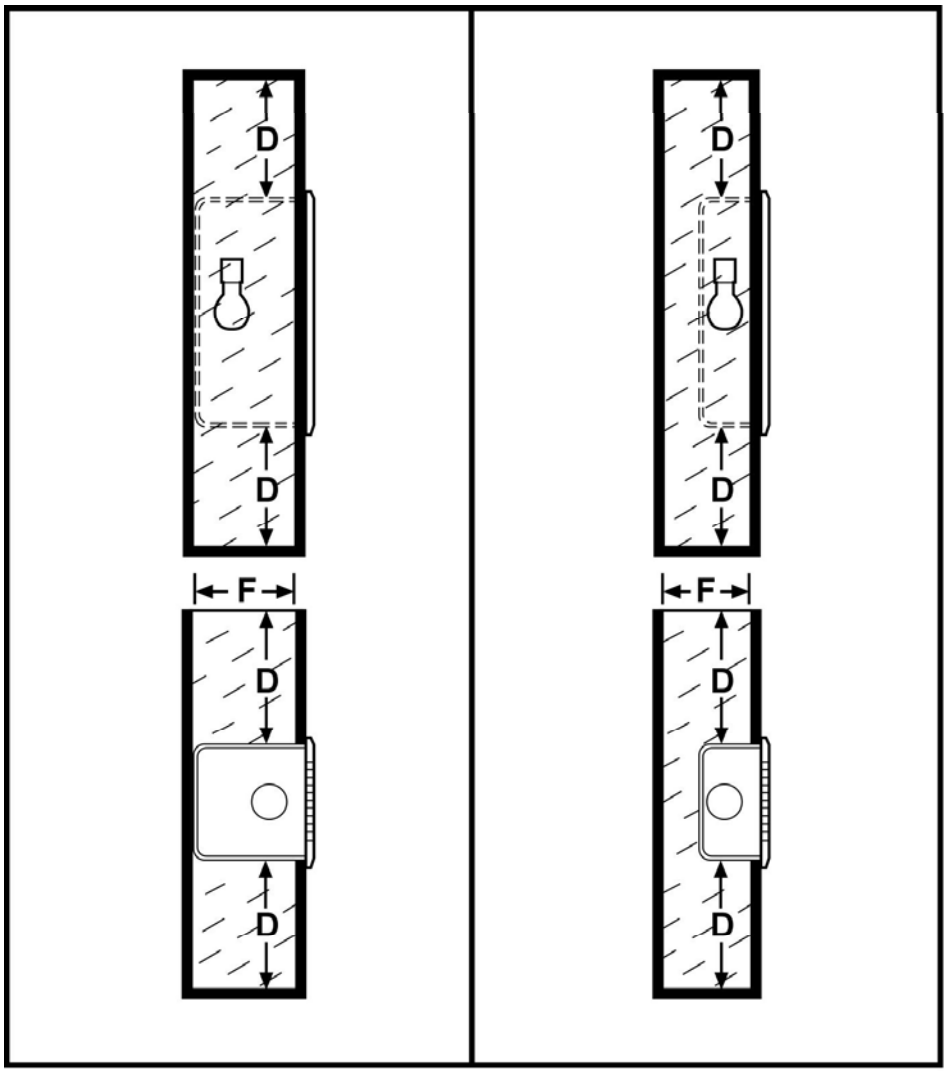
- ½" plywood "box"
- D ≥ 8.5"
- F = 6" or depth of luminaire



Adapted from UL 1598

Type IC Recessed Wall-mounted Temperature Test Apparatus

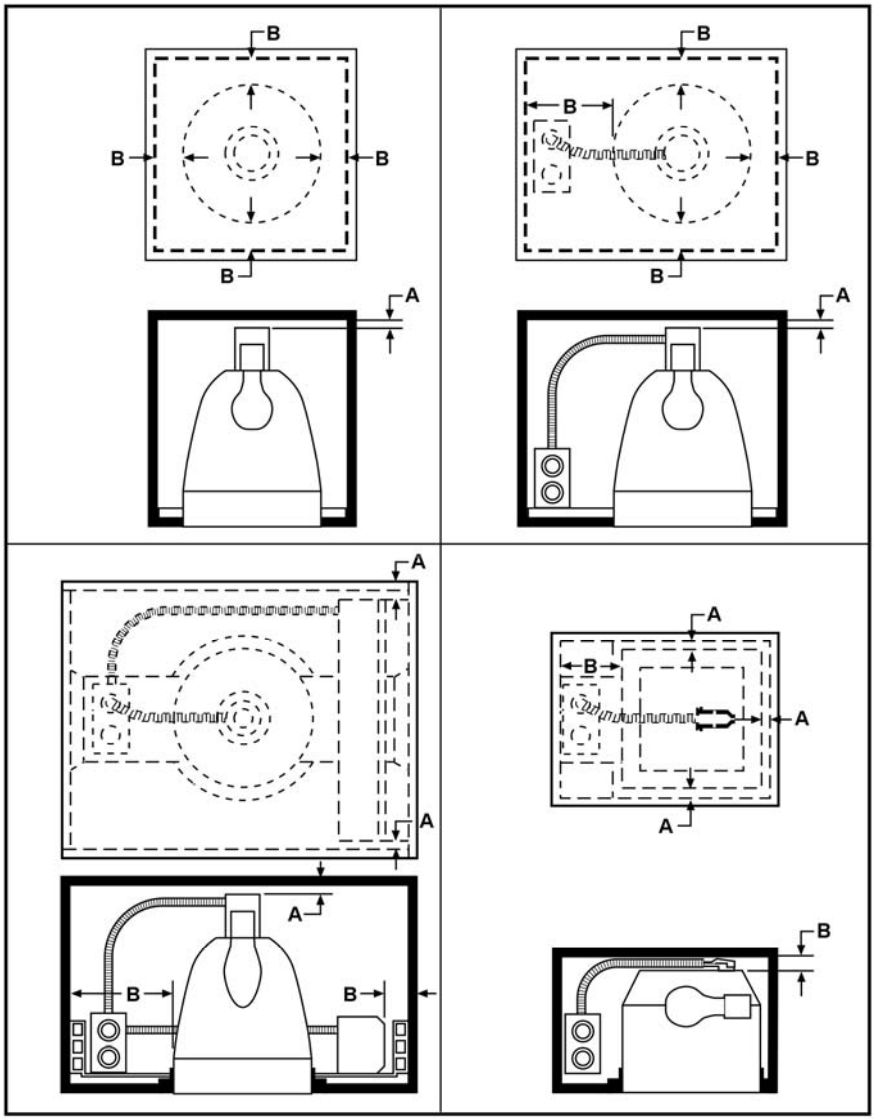
- ½" plywood “box”
- D ≥ 8.5"
- F = 6" or depth of luminaire
- Filled with Cellulose Insulation



Adapted from UL 1598

Type Non-IC Recessed Ceiling-mounted Temperature Test Apparatus

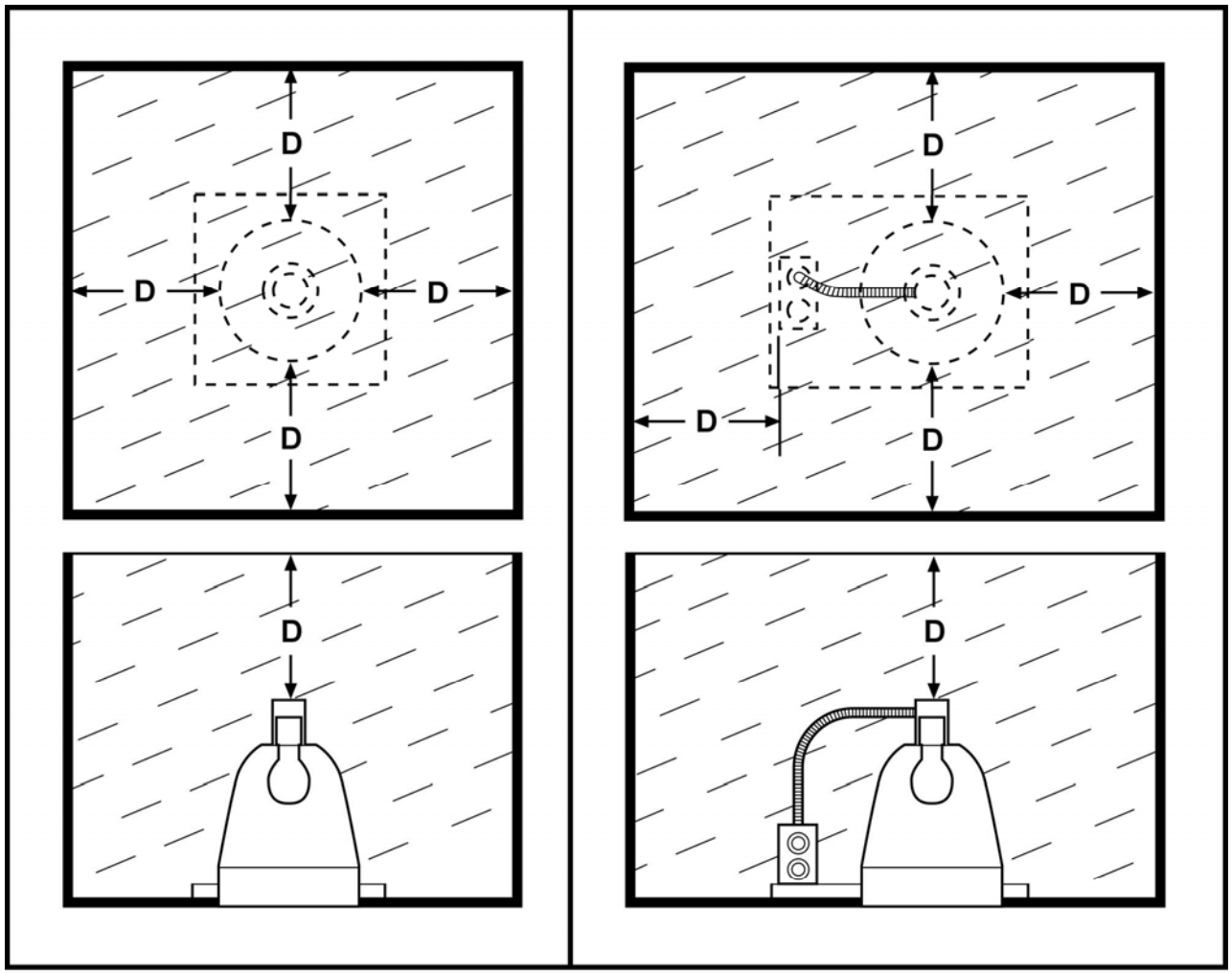
- ½" plywood “box”
- A = ½"
- B > ½"



Adapted from UL 1598

Type IC Recessed Ceiling-mounted Temperature Test Apparatus

- ½" plywood "box"
- Open top
- D ≥ 8.5"
- Filled with Cellulose Insulation



Adapted from UL 1598

Temperature Measurement Point (TMP)

- Manufacturer designated TMP correlating to LM-80 test report or power supply warranty
  - Module/Array
    - Solder Joint Temperature T_s
    - Case Temperature T_c
    - Board Temperature T_b
  - Power Supply
    - Case Temperature T_c
    - Could also be T_b for integral Power Supplies

Lumen Depreciation Qualification

- Option 1: Component Performance
  - Applicable if:
    - Module/Array has a current LM-80 test report
    - Module/Array has a designated TMP
    - TMP is accessible for in situ measurement
  - Otherwise manufacturer must use Option 2
- Option 2: Luminaire Performance
  - Entire luminaire subjected to LM-80

Lumen Depreciation Passing Criteria

A luminaire passes if the L_{70} threshold (≥ 25,000 hours for indoor residential and ≥ 35,000 for all others) …

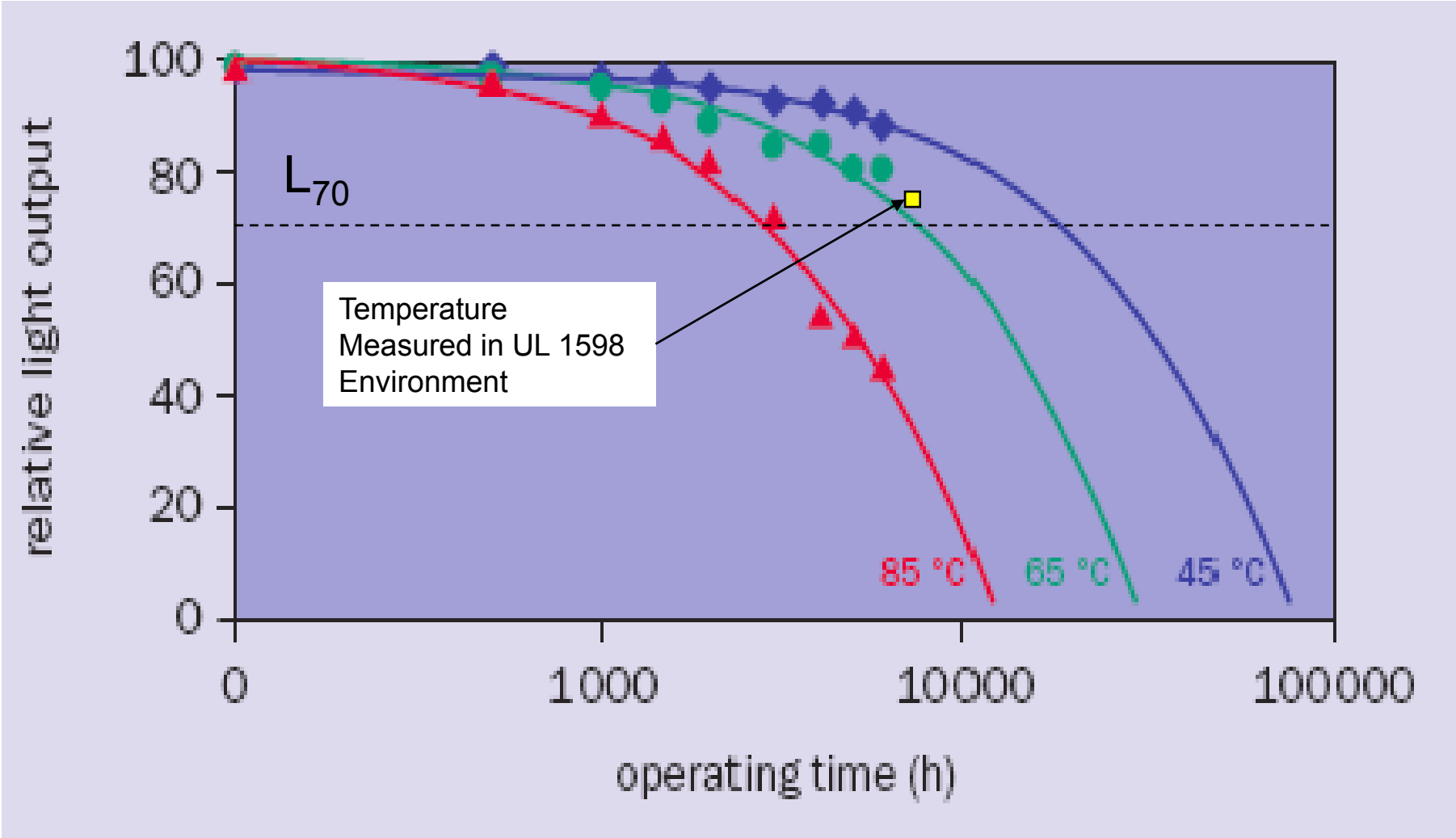
- if the in situ measured drive current is the same or lower

AND

- if the in situ measured TMP for the module/array is the same or lower

… than the LM-80 test report provided for the module/array.

Sample LM-80 Test Report



Questions?

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DOE SSL Website: www.netl.doe.gov/ssl/